

# Controlling the properties of matter with quantum dots

March 22, 2017



Solar cells and photodetectors could soon be made from new types of materials based on semiconductor quantum dots, thanks to new insights based on ultrafast measurements capturing real-time photoconversion processes.

Photoconversion is a process wherein the energy of a photon, or quantum of light, is converted into other forms of energy, for example, chemical or electrical. Semiconductor quantum dots are chemically synthesized crystalline nanoparticles that have been studied for more than three decades in the context of various photoconversion schemes including photovoltaics (generation of photo-electricity) and photo-catalysis (generation of “solar fuels”). The appeal of quantum dots comes from the unmatched tunability of their physical properties, which can be adjusted by controlling the size, shape and composition of the dots.

At Los Alamos, the research connects to the institutional mission of solving national security challenges through scientific excellence, in this case focusing on novel physical

principles for highly efficient photoconversion, charge manipulation in exploratory device structures and novel nanomaterials.

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